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Personal Data

Name:	Ai-Hua Liao
Sex:	Female
Place of Birth:	Hubei Province
Citizenship:	P. R. China
Web Page:	http://english.tjmu.edu.cn/About/Schools___Departments/Institute_of_Reproductive_Health/Introduction.htm

Education

9. 2003 – 6. 2006	Doctor of Medicine, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
5. 2003 – 2. 2005	Doctor of Medicine, Immunology Institute, University Hospital of Duisburg-Essen, Essen, Germany
9. 1990 – 6. 1993	Master of Medicine, Tongji Medical University, Wuhan, China
9. 1985 – 6. 1990	Bachelor of Medicine,Tongji Medical University, Wuhan, China

Working Experience

8. 2012 – 11. 2012	Visiting scholar, Reproductive Medicine, Department of Obstetrics and Gynecology, The Chicago Medical School at Rosalind Franklin University of Medicine and Science, Vernon Hills, IL, USA
11. 2009 – at present	Professor in Family Planning Research Institute (renamed as Institute of Reproductive Health in 2018), Center for Reproductive Medicine, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China

4. 2004 – 10. 2009	Associate professor in Family Planning Research Institute, Center for Reproductive Medicine, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
8. 2003 – 3. 2005	Study and conduct research work in Immunology Institute, University Hospital of Duisburg-Essen, Essen, Germany
4. 2003 – 7. 2003	Guest visitor in Gynecology and Obstetrics Department, University Hospital of Duisburg-Essen, Essen, Germany
7. 1996 – 4. 2003	Researcher and lecturer in Family Planning Research Institute, Center for Reproductive Medicine, Tongji Medical College, Huazhong University of Science and Technology, Wuhan, China
7.1993 – 6. 1996	Researcher and teaching assistant in Family Planning Research Institute, Center for Reproductive Medicine, Tongji Medical University, Wuhan, China

Research Interests

In 2006, I set up one of the earliest reproductive immunology units in China. The main research interest lies in understanding the maternal-fetal crosstalk in early pregnancy, and how the failed crosstalk leads to pregnancy-related disease including recurrent pregnancy loss and pre-eclampsia.

We found that trophoblasts in early pregnancy can educate and regulate Treg/Th17 cell balance or the polarization of macrophages at the maternal-fetal interface through immune checkpoint molecules (PD-L1, Gal-9), cytokines and chemokines (IL-27, CXCL2), and metabolites (lactic acid, vitamin D). Also, we found that the decidual stromal cells-derived Decorin can regulate the differentiation of decidual macrophages via mitochondrial metabolism. The dysfunction of these factors broke the maternal-fetal immune tolerance, leading to recurrent pregnancy loss or pre-eclampsia.

Currently, we are investigating how immune memory and immune cell aging contribute to the pathogenesis of recurrent pregnancy loss or pre-eclampsia. Also, we are exploring the immunological biomarkers for predicting female fertility and aging.

Research Grants

01. 2023 – 12.2027	Mechanism of LILRB3-mediated memory on decidual macrophages in regulating the occurrence of normal pregnancy and preeclampsia，supported by National Natural Science Foundation (No. 82220108008), Principal investigator
01. 2023 – 12.2026	Mechanism of PD-1 regulating the memory and function of decidual γδT cells on the outcome of subsequent pregnancy， supported by National Natural Science Foundation (No. 82271700), Principal investigator

01. 2019 – 06.2022 Immunological intervention for the reproductive disorders based on key factors, supported by the National Key Research and Development Program of China (No. 2018YFC1003904), Principal investigator

01. 2019 – 12.2021 Mechanism of Tiim-3^{+}Treg cells accumulating at the maternal-fetal interface and regulating the immune tolerance, supported by National Natural Science Foundation (No. 81871186), Principal investigator

01.2017 –12. 2020 Mechanism of PD-1/Tim-3 signal molecules regulating the polarization of decidual macrophages on the pathogenesis of pre-eclmpsia, supported by National Natural Science Foundation (No. 81671490), Principal investigator

01.2015– 12.2018 Mechanism of PD-1/PDL-1 signal pathway regulating Treg/Th17 cell balance on the pathogenesis of pre-eclmpsia, supported by National Natural Science Foundation (No. 81471475), Principal investigator

01.2016– 12.2018 Clinical implication and mechanism of Vitamin D supplementation on repeated implantation failure, supported by Merck Serono China Research Fund for Fertility (NO. 0231519043), Principal investigator

06.2014 – 12.2015 PD-1/PDL-1 signal pathway on the pathogenesis of pre-eclmpsia in rat model and the treatment efficacy of PD-L1：Fc, supported by Fundamental Research Funds for the Central Universities (No. 2014ZHYX017), Principal investigator

06.2012– 12.2013 Cyclic changes of peripheral and endometrial NK cells by endometrial scratching for repeated reproductive failure after artificial insemination by donor sperm, supported by Fundamental Research Funds for the Central Universities (No. 2012TS025), Principal investigator

01.2011 – 12.2013 Regulation of Treg cells on B cells in the pathogenesis of pr-eclampsia, supported by National Natural Science Foundation (No. 81070507), Principal investigator

07.2006 – 12.2008 The role and mechanism of humoral immunity in the pathogenesis of pre-eclampsia， supported by Hubei Province Research Foundation (2006AA301C21) and Hubei Province Family Planning Research Project (KG2006-2), Principal investigator

01.2006– 12.2008 ELISpot assay for detecting human memory B cell producing HLA antibodies, supported by National Natural Science Foundation (No. 3057170), Principal investigator

Rewards & Honors

1. Associated Editor of Hypertension in Pregnancy, 2023 to present
2. Associated Editor of Journal of Reproductive Immunology, 2023 to present.

3. Guest editor of Frontiers in Physiology on the Special Issue “Autophagy: Unveiling the Mechanisms and Implications in Health and Disease”，2023.
4. Guest editor of Biology on the Special Issue "Advances in Adverse Pregnancy Outcomes", 2022.
5. Editorial member of Journal of Reproductive Immunology, 2020 to 2023.
6. Associated Editor of American Journal of Reproductive Immunology, 2018 to present.
7. Distinguished Service Award of 39th Annual Meeting of American Society for Reproductive Immunology, 2019.
8. Member of Rewards Committee of American Society for Immunology of Reproduction, 2018 to present.
9. Chair of Hubei Society for Reproductive Immunology, 2018 to present.
10. Member of American Society for Immunology of Reproduction, 2013 to present.
11. Member of International Society for Immunology of Reproduction, 2011 to present.
12. Vice director of Youth Committee of Family Planning Branch from Chinese Medical Association, 2011 to present.
13. Member of National Society for Immunology in China, 2010 to present.
14. Associate secretary of Sexual Society in Hubei Province, 2010 to present.
15. Member of Reproductive Medical Association in Hubei Province, 2009 to present.
16. Session Chair at the Session 2 of “Immunity and its Checkpoint Molecules in Pregnancy-Related Complications including Recurrent Pregnancy Loss”, The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021.
17. Co-chair, John Gusdon Award Competition, In: American-Sino Joint Meeting of Reproductive Immunology (ASRI-CSI 2018), June 28-July 1, 2018, Shanghai, China.
18. Co-Chair, Session 12 on “Co-stimulatory signals and pathways at maternal fetal interface”, in: 37th annual congress for the American Society of Reproductive Immunology (ASRI), September 17-20, 2017; Chicago, USA.

Services as a Reviewer of Journal Manuscripts

New England Journal
Hypertension
eLife
Autoimmunity
Cell Death Disease
Molecular Immunology
Cell Molecular Signaling
Reproduction

Frontier Immunology

American Journal of Reproductive Immunology

Journal of Reproductive Immunology

Biology of Reproduction

Placenta

Andrologia

SCI reports

BMC Pregnancy and Childbirth

Clinical Science

BMC Biology

Phytomedicine

Seminars in Immunopathology

Publications

A complete list for Dr. Liao's publications can be found at:

https://pubmed.ncbi.nlm.nih.gov/?term=Liao+Aihua%2C+Wuhan&sort=date

1. Wang S, Mei Z, Chen J, Zhao K, Kong R, McClements L, Zhang H, L**iao A,** Liu C.. Maternal Immune Activation: Implications for Congenital Heart Defects. Clin Rev Allergy Immunol. 2025 Apr 2;68(1):36.

2. Xiao L, Mei Z, Chen J, Zhao K, Zhang H, Sharma S, **Liao A**, Liu C. Targeted Degradation Technology Based on the Autophagy-Lysosomal Pathway: A Promising Strategy for Treating Preeclampsia. Am J Reprod Immunol. 2025 Mar;93(3):e70066.

3. Gong GS, Zhang YJ, Hu XH, Lin XX, Liao AH. PD-1-Enhanced Treg Cell Senescence in Advanced Maternal Age. Adv Sci (Weinh). 2025 Feb;12(6):e2411613.

4. Maxwell A, Swanson G, Thy Nguyen A, Hu A, Richards D, You Y, Stephan L, Manaloto M, **Liao A**, Ding J, Mor G. Hydroquinone impairs trophoblast migration and invasion via AHR-twist-IFITM1 axis. Placenta. 2024 Sep 26;155:88-99.

5. Zhao SJ, Hu XH, Lin XX, Zhang YJ, Wang J, Wang H, Gong GS, Mor G, **Liao AH**. IL-27/Blimp-1 axis regulates the differentiation and function of Tim-3^{+}Tregs during early pregnancy. JCI Insight. 2024;Aug 22; 9(16):e179233.

6. Maxwell A, Swanson G, Nguyen AT, Hu A, Richard D, You Y, Stephan L, Manaloto M, Liao AH, Ding JH, Mor G. Hydroquinone impairs trophoblast migration and invasion via AHR-twist-IFITM1 axis. Placenta. 2024;155:1-12

7. Wang H, Wang L, Gong G, Lin X, Luo J, Liu C, Mor G, **Liao A**. Interleukin-10: a novel metabolic inducer of macrophage differentiation and subsequently contributing to improved pregnancy outcomes of mice by orchestrating oxidative phosphorylation metabolism. Biol Reprod. 2024 Jul 12;111(1):76-91

8. Tian Q, Yin Y, Tian Y, Wang Y, Wang YF, Fukunaga R, Fujii T, **Liao AH**, Li L, Zhang W, He X, Xiang W, Zhou LQ. Chromatin Modifier EP400 Regulates Oocyte Quality and Zygotic Genome Activation in Mice. Adv Sci (Weinh). 2024 Mar 17:e2308018.

9. Muyayalo KP, Gong GS, Kiyonga Aimeé K, **Liao AH**. Impaired immune response against SARS-CoV-2 infection is the major factor indirectly altering reproductive function in COVID-19 patients: a narrative review. Hum Fertil (Camb). 2023;26(4):778-796.

10. Fang XH, Li ZJ, Liu CY, Mor G, **Liao AH**. Macrophage memory: Types, mechanisms, and its role in health and disease. Immunology. 2024;171(1):18-30.

11. Lin X, Li Z, Gong G, Wang H, Fang X, Mor G, **Liao A**. The immune checkpoint protein PD-1: Its emerging regulatory role in memory T cells. J Reprod Immunol. 2023 Sep;159:104130.

12. Gong GS, Muyayalo KP, Zhang YJ, Lin XX, **Liao AH**. Flip a coin: cell senescence at the maternal-fetal interface. Biol Reprod. 2023;109(3):244-255.

13. Maxwell A, Adzibolosu N, Hu A, You Y, Stemmer PM, Ruden DM, Petriello MC, Sadagurski M, Debarba LK, Koshko L, Ramadoss J, Nguyen AT, Richards D, **Liao A**, Mor G, Ding J. Intrinsic sexual dimorphism in the placenta determines the differential response to benzene exposure. iScience. 2023;26(4):106287.

14. You Y, Grasso E, Alvero A, Condon J, Dimova T, Hu A, Ding J, Alexandrova M, Manchorova D, Dimitrova V, **Liao A**, Mor G. Twist1-IRF9 Interaction Is Necessary for IFN-Stimulated Gene Anti-Zika Viral Infection. J Immunol. 2023;210(12):1899-1912.

15. Liu C, Lu S, Liu S, Dong C, Chen Y, Xiao L, Zong Y, Zhang H, **Liao A**. 11.4 T ultra-high static magnetic field has no effect on morphology but induces upregulation of TNF signaling pathway based on transcriptome analysis in zebrafish embryos. Ecotoxicol Environ Saf. 2023 Apr 15;255:114754.

16. Wang J, Zhao SJ, Wang LL, Lin XX, Mor G, **Liao AH.** Leukocyte immunoglobulin-like receptor subfamily B: A novel immune checkpoint molecule at the maternal-fetal interface. J Reprod Immunol. 2023 Feb;155:103764.

17. Chen Y, Xiao L, Xu J, Wang J, Yu Z, Zhao K, Zhang H, Cheng S, Sharma S, **Liao A**, Liu C. Recent insight into autophagy and immunity at the maternal-fetal interface. J Reprod Immunol. 2023 Feb;155:103781.

18. Wang L, Wang H, Luo J, Xie T, Mor G, **Liao A**. Decorin promotes decidual M1-like macrophage polarization via mitochondrial dysfunction resulting in recurrent pregnancy loss. Theranostics. 2022 Oct 17;12(17):7216-7236.

19. Shi X, Zhao H, Kang Y, Dong X, Yu C, Xie Q, Duan Y, **Liao A**, Huang D. The Role of Mononuclear Phagocytes in the Testes and Epididymis. Int J Mol Sci. 2022 Dec 20;24(1):53.

20. Liu H, Zheng J, **Liao A**. The regulation and potential roles of m6A modifications in early embryonic development and immune tolerance at the maternal-fetal interface. Front Immunol. 2022 Sep 26;13:988130.

21. Wang H, Wang LL, Zhao SJ, Lin XX, **Liao AH**. IL-10: A bridge between immune cells and metabolism during pregnancy. J Reprod Immunol. 2022 Dec;154:103750.

22. Lin XX, Xie YM, Zhao SJ, Liu CY, Mor G, **Liao AH**. Human leukocyte antigens: the unique expression in trophoblasts and their crosstalk with local immune cells. Int J Biol Sci. 2022 Jun 13;18(10):4043-4052

23. Muyayalo KP, Song S, Liu C, Gong GS, Zhang YJ, Zhou H, Shen L, **Liao AH**. HLA-DR+ CD45RA- Tregs and CD28- Treg-like cells: Potential immunologic biomarkers for reproductive aging. Am J Reprod Immunol. 2022 Jun 30:e13591.

24. Qu G, Wang S, Zhou Z, Jiang D, **Liao A**, Luo J. Comparing Mouse and Human Tissue-Resident γδ T Cells. Front Immunol. 2022 Jun 8;13:891687.

25. Xu QH, Muyayalo KP, Zhang YJ, Wang H, Lin XX, **Liao AH**. Altered vitamin D metabolism is involved in the dysregulation of γδT cell function and their crosstalk with trophoblasts in recurrent pregnancy loss. Am J Reprod Immunol. 2022 Jun 15:e13581.

26. Wang LL, Li ZH, Wang H, Kwak-Kim J, **Liao AH**. Cutting edge: the regulatory mechanisms of macrophage polarization and function during pregnancy. J Reprod Immunol. 2022 Jun;151:103627.

27. Shi X, Zhao H, Kang Y, Dong X, Yu C, Xie Q, Duan Y, **Liao A**, Huang D. The Role of Mononuclear Phagocytes in the Testes and Epididymis. Int J Mol Sci. 2022 Dec 20;24(1):53.

28. Zhang YJ, Shen L, Zhang T, Muyayalo KP, Luo J, Mor G, **Liao AH**. Immunologic Memory in Pregnancy: Focusing on Memory Regulatory T Cells. Int J Biol Sci. 2022 Mar 6;18(6):2406-2418.

29. Ding J, Maxwell A, Adzibolosu N, Hu A, You Y, **Liao A**, Mor G. Mechanisms of immune regulation by the placenta: Role of type I interferon and interferon-stimulated genes signaling during pregnancy. Immunol Rev. 2022 Jul;308(1):9-24.

30. Liu H, Wang LL, Xu QH, Wang J, Zhang YJ, Luo J, **Liao AH**. UHRF1 shapes both the trophoblast invasion and decidual macrophage differentiation in early pregnancy. FASEB J. 2022 Apr;36(4):e22247.

31. Zhao SJ, Muyayalo KP, Luo J, Huang D, Mor G, **Liao AH**. Next generation of immune checkpoint molecules in maternal-fetal immunity. Immunol Rev. 2022 Jul;308(1):40-54.

32. Qian Zhu, Kahindo P, Muyayalo, Qian-Han Xu, Jing Wang, Huan Wang, **Ai-Hua Liao**. Prunella vulgaris can improve the pregnancy outcomes of experimental autoimmune thyroiditis rats by inhibiting Th1/Th17 immune responses. J Reprod Immunol.2022 Feb;149:103469.

33. Gao L, Xu QH, Ma LN, Luo J, Muyayalo KP, Wang LL, Huang DH, Xiao XJ, Cheng SB, Mor G, **Liao AH**. Trophoblast-derived Lactic Acid Orchestrates Decidual Macrophage Differentiation via SRC/LDHA Signaling in Early Pregnancy. Int J Biol Sci 2022; 18(2):599-616.

34. Hu XH, Li ZH, Muyayalo KP, Wang LL, Liu CY, Mor G, **Liao AH**. A newly intervention strategy in preeclampsia: Targeting PD-1/Tim-3 signaling pathways to modulate the polarization of decidual macrophages. FASEB J. 2022;36(1):e22073.

35. Muyayalo KP, Song S, Zhai H, Liu H, Huang DH, Zhou H, Chen YJ, **Liao AH**. Low vitamin D levels in follicular fluid, but not in serum, are associated with adverse outcomes in assisted reproduction. Arch Gynecol Obstet. 2022 Feb;305(2):505-517.

36. Ding J, Aldo P, Roberts CM, Stabach P, Liu H, You Y, Qiu X, Jeong J, Maxwell A, Lindenbach B, Braddock D, **Liao A**, Mor G. Placenta-derived interferon-stimulated gene 20 controls ZIKA virus infection. EMBO Rep. 2021 Oct 5;22(10):e52450.

37. Xu QH, Liu H, Wang LL, Zhu Q, Zhang YJ, Muyayalo KP, **Liao AH**. Roles of γδT cells in pregnancy and pregnancy-related complications. Am J Reprod Immunol.2021 Nov;86(5):e13487.

38. Wang LL, Liu H, Zhao SJ, Shen L, Xie T, Luo J, Mor G, **Liao AH**. The metabolic landscape of decidua in recurrent pregnancy loss using a global metabolomics approach. Placenta. 2021 Sep 1;112:45-53.

39. Huang X, Wang L, Zhao S, Liu H, Chen S, Wu L, Liu L, Ding J, Yang H, Maxwell A, Yin Z, Mor G, **Liao A**. Pregnancy Induces an Immunological Memory Characterized by Maternal Immune Alterations Through Specific Genes Methylation. Front Immunol. 2021 Jun 7;12:686676.

40. Liu H, Lin XX, Huang XB, Huang DH, Song S, Chen YJ, Tang J, Tao D, Yin ZN, Mor G, **Liao AH**. Systemic Characterization of Novel Immune Cell Phenotypes in Recurrent Pregnancy Loss. Front Immunol. 2021 May 28;12:657552..

41. Zhang Y, Wang L, Zhao S, Zhang C, He Q, **Liao A**. Predictive value of anti-Müllerian hormone on pregnancy outcomes in in-vitro fertilization/intracytoplasmic single sperm injection patients at different ages. Arch Gynecol Obstet.2021 Dec;304(6):1611-1620.

42. Zhao S, Xie T, Shen L, Liu H, Wang L, Ma X, Wu J, Yuan S, Mor G, **Liao A**. An Immunological Perspective: What Happened to Pregnant Women After Recovering From COVID-19? Front Immunol. 2021 Feb 3;12:631044.

43. Zhu Q, Xu QH, Xie T, Wang LL, Liu H, Muyayalo KP, Huang XB, Zhao SJ, **Liao AH**. Recent insights into the impact of immune dysfunction on reproduction in autoimmune thyroiditis. Clin Immunol. 2021 Mar;224:108663.

44. Wang L, Jiang P, Zhao S, Liu H, Liu L, Mor G, Liu C, **Liao A**. The dynamic profile and potential function of B-cell subsets during pregnancy.Cell Mol Immunol. 2021 Apr;18(4):1082-1084.

45. Ma X, Guan C, Chen R, Wang Y, Feng S, Wang R, Qu G, Zhao S, Wang F, Wang X, Zhang D, Liu L, **Liao A**, Yuan S. Pathological and molecular examinations of postmortem testis biopsies reveal SARS-CoV-2 infection in the testis and spermatogenesis damage in COVID-19 patients. Cell Mol Immunol. 2021 Feb;18(2):487-489.

46. You Y, Stelzl P, Joseph DN, Aldo PB, Maxwell AJ, Dekel N, **Liao, AH**, Whirledge S, Mor G.TNF-α Regulated Endometrial Stroma Secretome Promotes Trophoblast Invasion. Front Immunol. 2021 Nov 1; 12:737401.

47. Mei CL, Kang YF, Zhang CL, He CY, **Liao AH**, Huang DH. C-Type Natriuretic Peptide Plays an Anti-Inflammatory Role in Rat Epididymitis Induced by UPEC. Front Cell Infect Microbiol.2021 Aug 12;11:711842.

48. Chang TL, Song S, Huang DH, Su P, Xiao, XJ, Li HG, **Liao AH**, Xiang WP. Safety of lymphocytes immunotherapy during the COVID-19 outbreak in Wuhan, China. Arch Gynecol Obstet. 2021 Aug;304(2):567-569.

49. Hu X, Zhu Q, Wang Y, Wang L, Li Z, Mor G, **Liao A**. Newly characterized decidual Tim-3+ Treg cells are abundant during early pregnancy and driven by IL-27 coordinately with Gal-9 from trophoblasts. Hum Reprod. 2020 Nov 1;35(11):2454-2466.

50. Sharma S, Burd I, **Liao AH**. Special issue on COVID-19 and pregnancy: Consequences for maternal and neonatal health. Am J Reprod Immunol. 2020 Nov;84(5):e13354.

51. Liu H, Wang L, Wang Y, Zhu Q, Aldo P, Ding J, Mor G, **Liao A**. Establishment and characterization of a new human first trimester Trophoblast cell line, AL07. Placenta. 2020 Oct;100:122-132.

52. Muyayalo KP, Huang DH, Zhao SJ, Xie T, Mor G, **Liao AH.** COVID-19 and Treg/Th17 imbalance: Potential relationship to pregnancy outcomes. Am J Reprod Immunol. 2020 Nov;84(5):e13304.

53. Zhao H, Yu C, He C, Mei C, **Liao A**, Huang D. The Immune Characteristics of the Epididymis and the Immune Pathway of the Epididymitis Caused by Different Pathogens. Front Immunol. 2020 Sep 30;11:2115.

54. Liu H, Wang LL, Zhao SJ, Kwak-Kim J, Mor G, **Liao AH**. Why are pregnant women susceptible to COVID-19? An immunological viewpoint. J Reprod Immunol. 2020 Jun;139:103122.

55. Ma L-N, Huang X-B, Muyayalo KP, Mor G and **Liao A-H**. Lactic Acid: A Novel Signaling Molecule in Early Pregnancy? Front Immunol. 2020 Feb 27;11:279.

56. Hong Liu, Xiaobo Huang, Gil Mor, **Aihua Liao**. Epigenetic modifications working in the decidualization and endometrial receptivity. Cell Mol Life Sci. 2020 Jun;77(11):2091-2101.

57. Zhang YH, Aldo P, You Y, Ding JH, Kaislasuo J, Petersen JF, Lokkegaard E, Peng G, Paidas MJ, Simpson S, Pal L, Guller S, Liu H, **Liao AH**, Mor G. Trophoblast-secreted soluble-PD-L1 modulates macrophage polarization and function. J Leukoc Biol. 2020 Sep;108(3):983-998.

58. Kwak-Kim J, Ota K, Sung NY, Huang CS, Alsubki L, Lee S, Han JW, Han A, Yang XH, Saab W, Derbala Y, Wang WJ, He QH, **Liao AH,** Takahashi T, Cavalcante MB, Barini R, Bao SH, Fukui A, Ledee N, Coulam C. COVID-19 and immunomodulation treatment for women with reproductive failures. J Reprod Immunol. 2020 Sep; 141:103168.

59. Guo SS, Lv CY, Ouyang SJ, Wang XL, **Liao AH**, Yuan SQ. GOLGA4, A Golgi matrix protein, is dispensable for spermatogenesis and male fertility in mice. Biochem Biophys Res Commun. 2020 Aug 27;529(3):642-646.

60. Muyayalo KP, Huang XB, Qian Z, Mor G, **Liao AH**. Low circulating levels of vitamin D may contribute to the occurrence of preeclampsia through deregulation of Treg /Th17 cell ratio. Am J Reprod Immunol, 2019 Oct;82(4):e13168.

61. Xiaohui Hu, Yan Wang, Gil Mor, **Aihua Liao**. Forkhead box P3 is selectively expressed in human trophoblasts and decreased in recurrent pregnancy loss. Placenta.2019 Jun;81:1-8.

62. Ji J, Zhai H, Zhou H, Song S, Mor G, **Liao A.** The Role and Mechanism of Vitamin D-Mediated Regulation of Treg/Th17 Balance in Recurrent Pregnancy Loss. Am J Reprod Immunol.2019 Jun;81(6):e13112.

63. Zhang Y, Ma L, Hu X, Ji J, Mor G, **Liao A**. The role of the PD-1/PD-L1 axis in macrophage differentiation and function during pregnancy. Hum Reprod. 2019 Jan 1;34(1):25-36.

64. Li ZH, Wang LL, Liu H, Muyayalo KP, Huang XB, Mor G, **Liao AH**. Galectin-9 Alleviates LPS-Induced Preeclampsia-Like Impairment in Rats via Switching Decidual Macrophage Polarization to M2 Subtype. Front Immunol. 2019 Jan 10;9:3142.

65. Wang LL, Li ZH, Duan YG, Yuan SQ, Mor G, **Liao AH**. Identification of programmed cell death 1 and its ligand in the testicular tissue of mice. Am J Reprod Immunol. 2019 Feb;81(2):e13079.

66. You Y, Stelzl P, Zhaing Y, Porter J, Liu H, **Liao AH**, Aldo PB, Mor G. Novel 3D-In Vitro Models to Evaluate Trophoblast Migration and Invasion. Am J Reprod Immunol. 2019 Mar;81(3):e13076.

67. Dong J, Wang XL, Cao CC, Wen YJ, Sakashita A, Chen S, Zhang J, Zhang Y, Zhou LQ, Luo, MC, Liu MX, **Liao AH**, Namekawa SH, Yuan SQ. UHRF1 suppresses retrotransposons and cooperates with PRMT5 and PIWI proteins in male germ cells. Nature Communication. 2019 Oct 17;10(1):4705.

68. Muyayalo KP, Li ZH, Mor G, **Liao AH**. Modulatory effect of intravenous immunoglobulin on Th17/Treg cell balance in women with unexplained recurrent spontaneous abortion. Am J Reprod Immunol. 2018 Oct;80(4):e13018.

69. Zhang Y, Liu Z, Tian M, Hu X, Wang L, Ji J, **Liao A**. The altered PD-1/PD-L1 pathway delivers the 'one-two punch' effects to promote the Treg/Th17 imbalance in pre-eclampsia. Cell Mol Immunol. 2018 Jul;15(7):710-723.

70. Na L, Chen Y, Zhai H, **Liao A**, Huang D. Effects of maternal body mass index on pregnancy outcome after 8570 artificial insemination cycles with donor's sperm. Gynecol Endocrinol. 2018 Dec;34(12):1068-1072.

71. Zhang YH, He M, Wang Y, **Liao AH**. Modulators of the Balance between M1 and M2 Macrophages during Pregnancy. Front Immunol. 2017 Feb 9;8:120.

72. Wang LL, Li ZH, Hu XH, Muyayalo KP, Zhang YH, **Liao AH**. The roles of the PD-1/PD-L1 pathway at immunologically privileged sites. Am J Reprod Immunol. 2017 Aug;78(2).

73. Ji JL, Muyayalo KP, Zhang YH, Hu XH, **Liao AH**. Immunological function of vitamin D during human pregnancy. Am J Reprod Immunol. 2017 Aug;78(2).

74. Liu ZZ, Sun GQ, Hu XH, Kwak-Kim J, **Liao AH**. The transdifferentiation of regulatory T and Th17 cells in autoimmune/inflammatory diseases and its potential implications in pregnancy complications. Am J Reprod Immunol. 2017 Aug;78(2).

75. Hu XH, Tang MX, Mor G, **Liao AH**. Tim-3: Expression on immune cells and roles at the maternal-fetal interface. J Reprod Immunol. 2016 Nov;118:92-99.

76. Tian M, Zhang Y, Liu Z, Sun G, Mor G, **Liao A**. The PD-1/PD-L1 inhibitory pathway is altered in pre-eclampsia and regulates T cell responses in pre-eclamptic rats. Sci Rep. 2016 Jun 9;6:27683.

77. Huang D, Song S, **Liao A**. Short-term safety evaluation of the offspring conceived by 7272 artificial insemination cycles with donor spermatozoon. Andrologia. 2016 Sep;48(7):817-23.

78. Lin XJ, Tao HB, Cai M, **Liao AH**, Cheng ZH, Lin HF. A Systematic Review and Meta-Analysis of the Relationship Between Hospital Volume and the Outcomes of Percutaneous Coronary Intervention. Medicine (Baltimore). 2016 Feb;95(5): e2687.

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80. Zhang XH, Liu ZZ, Tang MX, Zhang YH, Hu Lian, **Liao AH**. Morphological Changes and Cytokine Expression after Local Endometrial Injury in a Mouse Model. Reprod Sci. 2015 Nov;22(11):1377-86.

81. Tang MX, Zhang YH, Hu Lian, Kwak-Kim J, **Liao AH**. CD14++CD16+HLA-DR+ Monocytes in Peripheral Blood are Quantitatively Correlated with the Severity of Pre-eclampsia. Am J Reprod Immunol. 2015 Aug;74(2):116-22.

82. Zhang YH, Tian M, Tang MX, Liu ZZ, **Liao AH**. Recent Insight into the Role of the PD-1/PD-L1 Pathway in Feto–Maternal Tolerance and Pregnancy. Am J Reprod Immunol. 2015 Sep;74(3):201-8.

83. Zhang Y, Kwak-Kim J, Huang D, Hu L, **Liao A**. Cyclic Changes and Relationship between Peripheral and Endometrial NK Cells from Women with Repeated Failure after Artificial Insemination by Donor Sperm. Am J Reprod Immunol. 2014 Jan;71(1):44-54.

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Chapter Books

1. **Ai-Hua Liao**, Kahinho P. Muyayalo. (2021) Toll-like receptors and NOD-like receptors at the implantation site. Reproductive Immunology (Basic Concepts). Chapter 14: 277-294.

2. **Ai-Hua Liao**, Hong Liu. (2021) The epigenetic regulation of the immune system during pregnancy. Reproductive Immunology (Basic Concepts). Chapter 19: 365-385.

Abstracts

1. L Gao, L-N Ma, G Mor, **A-H Liao**. A novel signaling molecule 'lactic acid' derived from trophoblasts can modulate macrophage polarization in early pregnancy. Am J Reprod Immunol 2021;85(S1):102-103.

2. L-L Wang, **A-H Liao**. Dynamic profile of macrophage and B cell subsets in decidua during early pregnancy. Am J Reprod Immunol 2021;85(S1):102.

3. H Liu, X-X Lin, X-B Huang, **A-H Liao**. Systemic atlas of functional immune cell phenotypes for recurrent pregnancy loss. Am J Reprod Immunol 2021;85(S1):103.

4. Y-J Zhang1, C-L Zhang, Q-H He, **A-H Liao**. Effect of thyroglobulin antibody on pregnancy outcomes o f in-vitro fertilization/intracytoplasmic single sperm injection patients. Am J Reprod Immunol 2021;85(S1):103-104.

5. X-H Hu, M Gil, **A-H Liao**. IL-27 and Gal-9 coordinately promote the accumulation of Tim-3^+ Treg cells in the decidua of early pregnancy. Am J Reprod Immunol 2021;85(S1):104.

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8. **AH Liao**, YH Zhang, ZH Li. PD-1 regulating macrophage polarization at the maternal-fetal interface. Am J Reprod Immunol 2018;80(S1):46.

9. LL Wang, Z-H Li, Y-G Duan, S-Q Yuan, **A-H Liao**. Expression pattern and localization of PD-1 and PD-L1 in the testicular tissues of mice. J Reprod Immunol. 2018;128:55.

10. ZH Li, LL Wang, **AH Liao**. The activation of Tim-3/Gal-9 pathway can alleviate the preeclampsia-like manifestations induced by LPS in rats by regulating the polarization of decidual macrophages. Am J Reprod Immuno**l** 2018;80(S1):46.

11. Z-H Li, L-L Wang, **A-H Liao**. Aberrant Tim-3/Gal-9 pathway involved in pathogenesis of pre-eclampsia in rat model by regulating the polarization of decidual macrophages. J Reprod Immunol. 2018;128:49.

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13. M Tian, Y Zhang, Z Liu, G Sun, G Mor, **A Liao**. Relationship between the PD-1/PD- L1 pathway and Treg/Th17 imbalance in preeclampsia and the protective effects of PD- L1Fc on pre-eclamptic rats. Am J Reprod Immunol. 2016;76(S1):45.

14. Yong-Hong Zhang, Xiao-Hui Hu, **Ai-Hua Liao**. PD-1 pathway regulates Treg/Th17 imbalance by interfering cell proliferation in pre-eclampsia. J Reprod Immunol 2016;115:82.

15. M Tian, Y Liu, Z-Z Liu, **A-H Liao**. Apoptosis of CD4+CD25+ Treg cells is increased in pre-eclampsia. Am J Reprod Immunol 2015;73 (Suppl. 2) : 57-58.

16. Y-H Zhang, Z-Z Liu, M-X Tang, **A-H Liao**. Expression of PD-1 and PD-L1 on peripheral Treg and Th17 cells in women with pre-eclampsia. Am J Reprod Immunol 2015;73 (Suppl. 2) : 79-80.

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18. Yang Z, Kwak-Kim J, Huang D, Lian H, **Liao A**. Cyclic changes and relationship of peripheral and endometrial NK cells from women with repeated failure after artificial insemination by donor sperm. Am J Reprod Immunol, 69(Suppl2): 70, 2013.

19. Tang MX, Zhang YH, **Liao AH**. Local morphological changes and upregulation of endometrial cytokines contribute to the improved embryo implantation after local endometrial injury in a mouse model. Am J Reprod Immunol, 69(Suppl2): 133, 2013.

20. **A-H Liao**, B Zeng, J Kwak-kim, Y Liu, M-X Tang, Y-H Zhang. Treg cells and B cells in pre-eclampsia. Am J Reprod Immunol 70(Supple 1):21-22, 2013.

21. M Tang, Y Zhang, **A Liao**. Roles of circulating monocyte subsets in normal pregnancy and pregnancy complications. Am J Reprod Immunol 70(Supple 1): 25, 2013.

22. **Ai-hua Liao,** Yue-chao Lu, Bing Zeng, Yang Zhang, Wen-pei Xiang, Lian Hu. Qntitative and functional changes of peripheral natural killer cells in women with reproductive failure after artificial insemination with donor sperm. J Reprod Immunol, 86(1): 46, 2010.

23. **Liao AH**, Zhang L, Liu LP, Zeng B. Humoral immunity and pre-ecalmpsia. Am J Reprod Immunol 64(Supple 1): 5, 2010.

International Conference Presentations

1. The role of immune-checkpoint moleculars in pre-eclampsia. The 2rd Asian Congress For Reporductive Immunology, Sept 6-8, 2024, Korea. (invited talk)

2. Identification of programmed cell death 1 and its ligand in the testicular tissue of mice. In: The 39th Annual Meeting of the American Society for Reproductive Immunology, June 12-15, 2019, Grand Rapids, Michigan, USA. (Session talk)

3. PD-1/PD-L1 signaling pathway regulating macrophage polarization during pregnancy and related complications. In: 2nd International Symposium of the Priority Research Center, 9th Symposium of Reproductive Immunology Study Group, November 21, 2018, Daejeon, Korea. (invited talk)

4. PD-1 regulating macrophage polarization at the maternal-fetal interface. In: American-Sino Joint Meeting of Reproductive Immunology (ASRI-CSI 2018), June 28-July 1, 2018, Shanghai, China. (invited talk)

5. Regulation of PD-1/PD-L1 signaling pathway on Treg/Th17 balance in pre-eclampsia. In: 37th Annual Meeting of the American Society for Reproductive Immunology, September 17-20, 2017; Chicago, USA. (invited talk)

6. Clinical and basic research on lymphocyte immunotherapy for reproductive failures in China. In: 21th Conference of Korean Study Group for Reproductive Immunology (KSGRI), March 22-23, 2014, Incheon, Korea. (invited talk)

7. Treg cells and B cells in pre-eclampsia. In: 3th International Conference on Reproductive Immunology, November 28-30, 2013; Shanghai, China. (invited talk)

8. Identification of programmed cell death 1 and its ligand in the testicular tissue of mice. In: 15th Conference of the European Society for Reproductive Immunology, August 28-31, 2018, Aalborg, Denmark. (oral presentation)

9. Tim-3/Gal-9 contribute to LPS-induced pre-eclampsia like syndrome in rats by regulating polarization of deciduas macrophage. In: American-Sino Joint Meeting of Reproductive Immunology (ASRI-CSI 2018), June 28-July 1, 2018, Shanghai, China. (oral presentation)

10. Detection of B cells secreting HLA antibodies by ELISpot. In: 12. Jahrestagung der Deutschen Gesellschaft für Immungenetik, October 14-16, 2004, Dresden, Germany. (oral presentation)

11. A novel signaling molecule ‘lactic acid’ derived from trophoblasts can modulate macrophage polarization in early pregnancy. The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021. (poster)

12. Dynamic profile of macrophage and B cell subsets in decidua during early pregnancy. The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021. (poster)

13. Systemic atlas of functional immune cell phenotypes for recurrent pregnancy loss. The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021. (poster)

14. IL-27 and Gal-9 coordinately promote the accumulation of Tim-3$^+$ Treg cells in the decidua of early pregnancy. The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021. (poster)

15. A traditional Chinese medicine ‘Prunella Vulgaris’ can improve the pregnancy outcome of autoimmune thyroiditis in rats by reducing Th1/ Th17 immunity. The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021. (poster)

16. Immunological profiling of pregnant women after recovering from COVID-19. The 40th Annual Meeting of the American Society for Reproductive Immunology (Virtual), May 14-21, 2021. (poster)

17. Activation of Tim-3/Gal-9 signaling pathway can alleviate the LPS-induced preeclampsia-like manifestations in rats by promoting decidual macrophage polarization to M2 subtype, in 14th Word Congress of the International Society for Immunology of Reproduction/The 34th Annual Meeting of the Janpanese Society for Immunology of Reproduction, Novmember 13-16, 2019, Nara City, Japan. (poster)

18. Effects of vitamin D on Treg/Th17 balance in recurrent pregnancy loss. In: American-Sino Joint Meeting of Reproductive Immunology (ASRI-CSI 2018), June 28-July 1, 2018, Shanghai, China. (poster)

19. PD-1/PD-L1 signaling regulates the polarization of decidual macrophages during early gestation. In: 50th SSR annual meeting, July 13-16, 2017; Washington DC, USA. (poster)

20. Expression and Location of PD-1 and PD-L1 in Testis and Epididymis of Mice. In: 50th SSR annual meeting, July 13-16, 2017; Washington DC, USA. (poster)

21. Kinetics of $Tim3^+CD4^+Foxp3^+$ regulatory T cells during pregnancy in mice. In: 36th Annual Meeting of the American Society for Reproductive Immunology, November 12-16, 2016; Baltimore, USA. (poster)

22. Relationship between the PD- 1/PD- L1 pathway and Treg/Th17 imbalance in preeclampsia and the protective effects of PD- L1Fc on pre- eclamptic rats. In: 36th Annual Meeting of the American Society for Reproductive Immunology, November 12-16, 2016; Baltimore, USA. (poster)

23. PD-1 pathway regulates Treg/Th17 imbalance by interfering cell proliferation in pre-eclampsia. In: 13th Congress of the International Society for Immunology of Reproduction (ISIR) and the European Society for Reproductive Immunology (ESRI), June 22-25, 2016; Erfurt, Germany. (poster)

24. Apoptosis of $CD4^+CD25^+$ Treg cells is increased in pre-eclampsia. In: 35th Annual Meeting of the American Society for Reproductive Immunology, June 2-5, 2015; Kingston, Canada. (poster)

25. Expression of PD-1 and PD-L1 on peripheral Treg and Th17 cells in women with pre-eclampsia. In: 35th Annual Meeting of the American Society for Reproductive Immunology, June 2-5, 2015; Kingston, Canada. (poster)

26. Decreased Tregs cells and increased memory B cells in peripheral blood of patients with pre-eclampsia. In: 12th International Congress of Reproductive Immunology, May 28-June 1, 2013; Boston, USA. (poster)

27. Cyclic changes and relationship of peripheral and endometrial NK cells from women with repeated failure after artificial insemination by donor sperm. In: 12th International Congress of Reproductive Immunology, May 28-June 1, 2013; Boston, USA. (poster)

28. Local morphological changes and upregulation of endometrial cytokines contribute to the improved embryo implantation after local endometrial injury in a mouse model. In: 12th International Congress of Reproductive Immunology, May 28-June 1, 2013; Boston, USA. (poster)

29. Roles of circulating monocyte subsets in normal pregnancy and pregnancy complications. In: 3th International Conference on Reproductive Immunology, November 28-30, 2013; Shanghai, China. (poster)

30. Quantitative and functional changes of peripheral natural killer cells in women with reproductive failure after artificial insemination with donor sperm. In: 11th International Congress in Reproductive Immunology, August 15-19, 2010, Cairns, Australia. (poster)

31. Humoral immunity and pre-ecalmpsia. In: 2th International Conference on Reproductive Immunology, November 29-December 2, 2010, Shanghai, China.

Mentoring (Since 2006)

Total 14 doctoral and 18 postgraduate students were mentored in China or abroad. Among them, 7, as Ph.D. candidates, were received the official overseas grant from the China Scholarship Council, and went to Ghent University in Belgium (2 persons), Yale University (1 person), Wayne State University (1

person), Jena University in Germany (1 person), Copenhagen University in Denmark (1 person), and Helsinki University in Finland (1 person).